Cave Presentation

Concept
Caves located in the Recharge Zone drain water into the Edwards Aquifer.

Objective - Students will:
1) interpret the setting of the Austin area 75 million years ago;
2) examine the special properties of limestone rock, identifying the calcite mineral and explaining cave dissolution and stalactitie and stalagmite formation;
3) identify features of karst aquifers such as caves, sinkholes, fractures and faults;
4) identify a cave as a recharge feature of the Edwards Aquifer;
5) identify some animals that live in caves;
6) explain how surface water enters the Edwards Aquifer through Recharge Features;
7) identify the endangered Barton Springs salamander and;
8) explain ways to protect the water of the Edwards Aquifer.

Time 45 minute session

Materials
- Cave Powerpoint CD
- Powerpoint projecter
- Laptop computer

Preparation
IMPORTANT: THIS IS A CLASSROOM PRESENTATION.
1. Set up the projector.
2. Load the powerpoint CD.
3. Keep a copy of the lesson where you can easily refer to the information for each slide.

EXTENSION: If you would like to schedule a field trip, call a commercial cave located in the Edwards Aquifer (Innerspace Caverns, Natural Bridge Caverns), or call the Austin Nature and Science Center (327-8181)to set up a wild cave tour.

Vocabulary: recharge, cave, stalactite, stalagmite, sinkhole, fracture, fault, Edwards Aquifer, groundwater, limestone, karst, spring

1. Title Page

2. Beach Scene: This is what the Austin area looked like 75,000,000 years ago. There was a shallow, tropical (warm), prehistoric sea. There were no people yet, but many kinds of animals lived in and near the ocean...

3. Cretaceous Marine Swimming Reptiles: ...animals that included dinosaurs. Fossils of these prehistoric animals have been found in the Austin area. We know they lived in the shallow sea that was here 75,000,000 years ago because their bones were found buried in the limestone that was formed from the sea bottom.

4. Georgetown Clam: The seashells living in the prehistoric sea along with sand and sediment are what formed the limestone in the Austin area. As a result, fossils of seashells are abundant in Austin. Many of the seashells were very large like the clam you see in the picture.

5. Volcano: There were a number of volcanoes in the Austin area 75,000,000 years ago. Most were underwater. The ash from the volcano would blow out of the water, settle on the bottom of the sea and later form a type of soft rock called volcanic tuff.

6. Calcite Mineral: Seashells and sediment containing calcite formed limestone (along with a few other trace minerals). Calcite dissolves in rainwater. This is how the holes and caves in the Edwards Aquifer are formed. Notice the holes and small paths formed in the limestone from the raindrops.

7. Dissolution of Limestone Rock: Another example of holes formed in limestone.

8. Karst Aquifer: The Edwards Aquifer is formed from the holes and passages dissolved in limestone. Many of the holes and passages are large enough for people to enter. Then it is called a cave. The caves, smaller openings called sinkholes, and cracks (fractures and faults) open on the surface of the land in the Recharge Zone. Rainwater travels down to the Aquifer through the openings on the surface, and continues underground through the system of passages called the Edwards Aquifer.

9. Creekwater Disappearing into Dry Fork Sink: Many of the openings in the Recharge Zone are located in the bottom of creeks. The creekwater can enter the aquifer so quickly that it looks like the creek is disappearing underground, like the one in this picture. Any pollution washed off the watershed into the creek can also travel underground.

10. Whirlpool: Sometimes a creek is large enough not to disappear completely underground, like the example you see here. This is Onion Creek. You can tell some of the water in the creek is going into the aquifer because of the whirlpool formed on the surface. During dry periods, this part of Onion Creek does not have water, and the cave entrance you see below the water can be entered and studied.

11. Airman's Cave/Fracture: A fault is a crack or break in a layer of rock. The fault in this picture is slanting vertically behind the head of the man standing in the picture. Caves tend to form along faults because water easily enters the cracked opening causing dissolution of the limestone.

12. Bats: Caves are large openings channeling lots of water underground into the aquifer. Caves are also home to special kinds of animals that depend on caves for habitat, like bats...

13. Going Inside A Cave: ...and human animals! Here is David Johns, one of our hydrogeologists, preparing to enter a cave to study and better understand how to protect the Edwards Aquifer.

14. Pit in Midnight Cave: Some caves, like this one called Midnight Cave, drop vertically in a long pit down to the Aquifer. Pit caves can only be entered using a rope for descending.

15. Slimy Salamander: Slimy salamanders like to live near the cave entrance. They feed on flying insects and other bugs, including crickets. These shy salamanders live under rocks and ledges, so be careful where you step!

16. Cave Cricket: Cave crickets live on the ceiling and walls of the cave and leave at night to feed.

17. Cave Beetle: Cave beetles live in the dry, loose, disturbed dirt and limestone floor of the cave, where it often finds cricket eggs to eat. This beetle is about the size of a large red ant.

18. Stalictites, Stalagmites, and Columns: When water flows underground, it dissolves the calcite in the limestone as mentioned earlier. The calcite dissolved from the limestone is redeposited inside the cave forming stalactites (which hold tight to the ceiling), stalagmites (which might meet the ceiling someday) and columns (when a stalactite and stalagmite meet).

19. Millipede: Millipedes eat fungus and bacteria and prefer the darker, more wet areas of the cave.

20. Blowing Sink Cave: Here is a cave passage carved out by stormwater. You can see a lot of water travels through the aquifer during large rainstorms.

21. Wet Cave Passage: This is a cave passage with water flowing through the Aquifer.

22. Cave Stream in Blowing Sink Cave: Although the water enters the Aquifer at the surface of the land, it travels deep underground (254 feet) as it travels through the Aquifer. The lower levels of the Aquifer are full of water.

23. Pool in Midnight Cave: Here is the pool of water collected at the bottom of the pit of Midnight Cave. This water will continue traveling underground through the Edwards Aquifer.

24. Endangered Barton Springs Salamander: The Barton Springs Salamander is an animal that depends on the water in the Edwards Aquifer to survive. The salamander is listed as endangered, which means there are not very many of them in existence and they could easily become extinct. They have only been found in the Edwards Aquifer at Barton Springs. We protect the water in the Edwards Aquifer for humans who swim in and drink the water, but also for the sensitive animals like the salamander that depend on the clean, cool water for habitat.

25. Close-Up of Salamander: The salamander's gills are located outside its body. Because its gills are constantly exposed to the water in the Edwards Aquifer, if any pollution is present, the health of the salamander would be affected. The health of the salamaders helps our scientists determine the health of the Aquifer.

26. Salamander Larvae: The Barton Springs Salamander are small in number; only 60-90 have been counted by our scientists in Barton and surrounding springs during any one month (although there could be more living inside the Aquifer). The salamander could easily be killed by a pollution spill washing through the Aquifer. As a result, the Watershed Protection Department has a Captive Breeding Program for the Barton Springs Salamander. What that means is that we keep some in a fish tank where they are protected from the environment. This is a picture of one of our baby salamanders before it has hatched.

27. Isopods: These tiny shrimp-like animals also live in the Edwards Aquifer. They are the salamanders' favorite food.

28. Groundwater Coming Out of Spring:

1) **Barton Springs:** Most of the water traveling through the Edwards Aquifer in the southwest part of Austin comes out at Barton Springs.
2) **Stillhouse Springs:** Some springs are just small seeps. Maidenhair fern and other wetland plants grow around seeps.
3) **Cold Springs:** Cold Springs is located on the Colorado River upstream of Barton Springs. Some of the water flowing through the Aquifer in southwest Austin comes out at Cold Springs.

29. Groundwater Tracing: We know where the water from some of the caves and sinkholes in southwest Austin travels because our hydrogeologists trace the path of the groundwater. A colored dye is put in a cave or sinkhole, flushed through with a firehose or rainstorm, and the springs aretested to see where the water comes out.

30. Groundwater Tracing Results: This is a map of the caves and sinkholes that have been dye-traced. Wildflower Cave is located between J and H. The water from Jand H flowed to Barton Springs. It took from 1 to 7 days for the water to get from the LBJ Wildflower Center area to Barton Springs traveling underground through the Aquifer. That is very quickly for groundwater flow. There are no soil or plants underground in the Aquifer to filter any pollution from the water. As you saw in the previous pictures, the water travels through large underground passages. So if pollution enter s the Aquifer, it travels through it and comes out in Barton Springs.

31. Ways You Can Help: The key to keeping the Barton Springs Edwards Aquifer clean is to make sure the water is clean that flows off the surface of the land into caves and other types of openings in the ground. People who live, play, or work over the Aquifer can make some choices to help keep runoff clean (the same as people who live on watersheds make clean choices). **Read the suggestions on the slide.**

32. Karst Preserves in Austin: One way to create green spaces around caves is to set aside a preserve. Here are some of the preserves in Austin established to protect the Edwards Aquifer. The Austin Nature and Science Center will take you on a tour inside some of these wild caves.

33. Caves in the Edwards Aquifer: You can also go into larger, commercial caves located in